WE CLAIM:

1. A dispersion discrimination and compensation system, comprising:

an anti-dispersive element having an input for receiving a first optical signal and an output for providing a second optical signal, said anti-dispersive element being adapted to apply dispersion compensation to the first optical signal in response to receipt of a first control signal, thereby to produce the second optical signal;

a dispersion discriminator connected to said anti-dispersive element and adapted to determine a dispersion characteristic of the second optical signal, said dispersion discriminator being further adapted to generate a second control signal indicative of the dispersion characteristic of the second optical signal; and

a processor connected to the dispersion discriminator and to the anti-dispersive element, said processor being adapted to generate the first control signal as a function of the second control signal, thereby to exert feedback control of the dispersion compensation applied to the first optical signal by the anti-dispersive element.

2. A system as defined in claim 1, further comprising:

an optical splitter connected to said dispersion discriminator and to the output of said anti-dispersive element, for tapping the second optical signal and feeding it to said dispersion discriminator.

3. A system as defined in claim 1, wherein the dispersion characteristic is polarity.

4. A system as defined in claim 1, wherein the dispersion characteristic is magnitude.

5. A system as defined in claim 1, wherein the dispersion is chromatic dispersion.

6. A system as defined in claim 1, wherein the dispersion is polarization dispersion.

7. A system as defined in claim 1, wherein the first and second optical signals are multi-channel optical signals, the system further comprising:

a Front End Selector (FES) connected between said dispersion discriminator and the output of said anti-dispersive element, the FES having an FES input for accepting the second optical signal, said FES being adapted to select a single channel in the second optical signal and to provide the selected channel to said dispersion discriminator;

wherein the dispersion characteristic of the second optical signal determined by the dispersion discriminator includes a dispersion characteristic of the selected channel in the second optical signal.

8. A dispersion discrimination and compensation system, comprising:

a plurality of anti-dispersive elements, each having an input for receiving a respective first multi-channel optical signal and an output for providing a respective

second multi-channel optical signal, each of said plurality of anti-dispersive element being adapted to apply dispersion compensation to the respective first multi-channel optical signal in response to receipt of a respective first control signal, thereby to produce the respective second multi-channel optical signal;

a front end selector (FES) having an FES output and also having a plurality of FES inputs each connected to the output of a respective one of said plurality of anti-dispersive elements, each FES input accepting a respective one of the plurality of second multi-channel optical signals, said FES being adapted to select an FES input from the plurality of FES inputs, to select a single channel in the optical signal present at the selected FES input and to provide the selected channel to the FES output;

a dispersion discriminator connected to the FES output and adapted to determine a dispersion characteristic of the optical signal present at the FES output, said dispersion discriminator being further adapted to generate a second control signal indicative of the dispersion characteristic of the optical signal present at the FES output; and

a processor connected to said dispersion discriminator and to said plurality of anti-dispersive elements, said processor being adapted to generate, as a function of the second control signal, the first control signal for the anti-dispersive element whose output is connected to the selected FES input, thereby to exert feedback control of the dispersion compensation applied by that anti-dispersive element.

9. A system as defined in claim 8, wherein said processor is further connected to said FES and wherein said processor is further adapted to control selection of the FES input and selection of the channel in the optical signal present at the selected FES input.

10. A system as defined in claim 8, wherein said processor is further connected to said FES and wherein said processor is further adapted to receive information signals from the FES containing information about which FES input is selected by said FES and which channel is selected in the optical signal present at the selected FES input.

11. A system as defined in claim 8, further comprising:

a plurality of optical splitters connected to said FES and each connected to the output of a respective anti-dispersive element from said plurality anti-dispersive elements, for tapping the plurality of second optical signals and feeding them to said FES.

12. A method of compensating for dispersion present in a first optical signal, comprising:

applying an amount of dispersion compensation to the first optical signal, thereby to produce a second optical signal;

determining a dispersion characteristic of the second optical signal; and

on the basis of the determined dispersion characteristic of the second optical signal, regulating the amount of dispersion compensation applied to the first optical signal.

13. A method as defined in claim 12, wherein determining a dispersion characteristic of the second optical signal comprises determining a polarity of chromatic dispersion present in the second optical signal.

14. A method as defined in claim 12, wherein determining a dispersion characteristic of the second optical signal comprises determining a magnitude of chromatic dispersion present in the second optical signal.

15. A method as defined in claim 12, wherein determining a dispersion characteristic of the second optical signal comprises determining a polarity of polarization dispersion present in the second optical signal.

16. A method as defined in claim 12, wherein determining a dispersion characteristic of the second optical signal comprises determining a magnitude of polarization dispersion present in the second optical signal.

17. A switch for optical signals, comprising:

a plurality of optical input ports for accepting a first plurality of optical signals;

a plurality of optical output ports for providing a second plurality of optical signals;

a switch matrix connecting said plurality of optical input ports to said plurality of optical output ports; and

a dispersion discrimination and compensation subsystem adapted to provide variable dispersion compensation to the first plurality of optical signals,

thereby producing the second plurality of optical signals, wherein the dispersion compensation applied is regulated through a feedback loop.

18. A switch as defined in claim 17, wherein the first and second plurality of optical signals are composed of multi-channel optical signals and wherein said dispersion discrimination and compensation subsystem comprises:

a plurality of anti-dispersive elements, each having an input for receiving a respective first multi-channel optical signal from among the first plurality of optical signals and an output for providing a respective second multi-channel optical signal from among the second plurality of optical signals, each said anti-dispersive element being adapted to apply dispersion compensation to the respective first multi-channel optical signal in response to receipt of a respective first control signal, thereby to produce the respective second multi-channel optical signal;

a front end selector (FES) having an FES output and also having a plurality of FES inputs each connected to the output of a respective one of the plurality of anti-dispersive elements, each FES input accepting a respective one of the plurality of second multi-channel optical signals, said FES being adapted to select an FES input from the plurality of FES inputs, to select a single channel in the optical signal present at the selected FES input and to provide the selected channel to the FES output;

a dispersion discriminator connected to the FES output and adapted to determine a dispersion characteristic of the optical signal present at the FES

output, said dispersion discriminator being further adapted to generate a second control signal indicative of the dispersion characteristic of the optical signal present at the FES output; and

a processor connected to the dispersion discriminator and to the plurality of anti-dispersive elements, said processor being adapted to generate, as a function of the second control signal, the first control signal for the anti-dispersive element whose output is connected to the selected FES input, thereby to exert feedback control of the dispersion compensation applied by that anti-dispersive element.

19. A switch as defined in claim 18, wherein each of said plurality of anti-dispersive elements is disposed between one of said plurality of input ports and said switch matrix.

20. A switch as defined in claim 18, wherein each of said plurality of anti-dispersive elements is disposed between said switch matrix and one of said plurality of output ports.

21. A switch as defined in claim 18, further comprising a switch controller connected to the processor by a communication link, said switch controller being adapted to provide connection map information to said processor through said communication link.

22. A switch as defined in claim 21, wherein said processor is adapted to detect a failure to provide dispersion compensation by said switch and wherein said

processor is adapted to inform said switch controller of the failure through said communication link.

23. A switch as defined in claim 18, wherein said FES is adapted to select an FES input from the plurality of FES inputs and to select a single channel in the optical signal present at the selected FES input according to instructions contained in a third control signal provided by said processor.

24. A switch as defined in claim 17, further comprising a path integrity verification subsystem comprising

a first verification optical link connected between one of said plurality of optical input ports and said switch matrix;

a second verification optical link connected between one of said plurality of optical input ports and said switch matrix; and

a processor connected to said first and a second verification optical links for comparing a first and a second verification signals to evaluate a switching function of said switch matrix, the first and a second verification signals being provided respectively by said first and second verification optical links.

25. A switch as defined in claim 17, wherein:

each of said first plurality of optical signals is a WDM signal;

said switch matrix comprises a plurality of per-wavelength switching planes; and

said switch further comprises:

a plurality of wavelength division demultiplexing (WDD) devices, each connected to a respective one of said optical inputs, each of said WDD devices providing a plurality of demultiplexed optical signals to said plurality of per-wavelength switching planes;

a plurality of wavelength division multiplexing (WDM) devices, each one connected to one of said optical outputs, each WDM devices accepting a plurality of switched optical signals from said per-wavelength switching planes.

26. A switch as defined in claim 25, further comprising a plurality of variable optical intensity controllers (VOICs), wherein the second plurality of optical signals comprises at least one multi-channel output signal comprising a plurality of data channel and wherein said switch further comprises a power equalizing system adapted to provide equalization of optical power of the plurality of data channels through the plurality of VOICs, the plurality of VOICs being connected between said switch matrix and said plurality of WDM devices.

27. A switch as defined in claim 25, wherein said dispersion discrimination and compensation subsystem comprises:

a plurality of anti-dispersive elements, each having an input for receiving a respective first single-channel optical signal outgoing from a respective one of said per-wavelength switching plane (each being one of the switched optical signals), and an output for providing a respective second single-channel optical signal to one of said WDM devices, each said anti-dispersive element being

adapted to apply dispersion compensation to the respective first single-channel optical signal in response to receipt of a respective first control signal, thereby to produce the respective second single-channel optical signal;

a first front end selector (FES) having a first FES output and also having a plurality of first FES inputs each connected to the output of a respective one of the plurality of WDM devices and each receiving a first multi-channel optical signal, said first FES being adapted to select a first FES input from the plurality of first FES inputs, to select a third single channel in the first multi-channel optical signal present at the selected first FES input and to provide the third single channel to the first FES output;

a dispersion discriminator connected to the first FES output and adapted to determine a first dispersion characteristic of the optical signal present at the first FES output, said dispersion discriminator being further adapted to generate a second control signal indicative of the first dispersion characteristic of the third single channel; and

a processor connected to the dispersion discriminator and to the plurality of anti-dispersive elements, said processor being adapted to generate, as a function of the second control signal, the first control signal for the anti-dispersive element whose output contains the third single channel, thereby to exert feedback control of the dispersion compensation applied by that anti-dispersive element.

28. A switch as defined in claim 27, further comprising a switch controller connected to the processor by a communication link, said switch controller being adapted to provide connection map information to said processor through said communication link.

29. A switch as defined in claim 28, wherein:

said dispersion discrimination and compensation subsystem further comprises a second FES having a second FES output and also having a plurality of second FES inputs each connected to said plurality of optical input ports, each second FES input accepting a respective one of the plurality of first multi-channel optical signals, said second FES being adapted to select a second FES input from the plurality of second FES inputs, to select a fourth single channel in the optical signal present at the selected second FES input and to provide the fourth selected channel to the second FES output;

said DD is further connected to the second FES output and adapted to determine a second dispersion characteristic of the optical signal present at the second FES output, said dispersion discriminator being further adapted to generate a fourth control signal indicative of the second dispersion characteristic of the optical signal present at the second FES output; and

said processor is adapted to receive said fourth control signal, to detect a failure to provide appropriate dispersion compensation by said switch using said second and fourth control signals, and to inform said switch controller of the failure through said communication link.

30. A switch as defined in claim 27, wherein said first FES is adapted to select an FES input from the plurality of FES inputs and to select the third single channel in the optical signal present at the selected FES input according to instructions contained in a third control signal provided by said processor.

31. A switch as defined in claim 17, wherein:

each of said first plurality of optical signals is a WDM signal;

said switch matrix comprises a plurality of per-wavelength switching planes; and

said switch further comprises:

a plurality of banded wavelength division demultiplexing (BWD) devices, each one connected to one of said optical input ports,

a plurality of wavelength division demultiplexing (WDD) devices, each one connected to one of said BWD devices and each one providing a plurality of fully demultiplexed optical signals to at least two per-wavelength switching planes of said plurality of per-wavelength switching planes;

a plurality of wavelength division multiplexing (WDM) devices, each one connected to one of said optical output ports, each WDM device accepting a plurality of switched optical signals from said per-wavelength switching planes to produce a respective one of a first plurality of multi-channel optical signals.

32. A switch as defined in claim 31, wherein said dispersion discrimination and compensation subsystem comprises:

a plurality of anti-dispersive elements, each having an input for receiving a respective second multi-channel optical signal outgoing from one of said BWD devices and an output for providing a respective third multi-channel optical signal to one of said WDD devices, each said anti-dispersive element being adapted to apply dispersion compensation to the respective second multi-channel optical signal in response to receipt of a respective first control signal, thereby to produce the respective third multi-channel optical signal;

a front end selector (FES) having a FES output and also having a plurality of FES inputs each connected to the output of a respective one of the plurality of WDM devices, each FES input accepting a respective one of the plurality of first multi-channel optical signals, said FES being adapted to select a FES input from the plurality of FES inputs, to select a single channel in the optical signal present at the selected FES input and to provide the selected channel to the FES output;

a dispersion discriminator connected to the FES output and adapted to determine a dispersion characteristic of the optical signal present at the FES output, said dispersion discriminator being further adapted to generate a second control signal indicative of the dispersion characteristic of the optical signal present at the FES output; and

a processor connected to the dispersion discriminator and to the plurality of anti-dispersive elements, said processor being adapted to generate, as a function of the second control signal, the first control signal for the anti-dispersive element whose output contains the optical signal present at the first FES

output, thereby to exert feedback control of the dispersion compensation applied by that anti-dispersive element.